

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of the claims.

- 1-23. (Cancelled).
24. (New) A system for characterizing physiological activity comprising:
a sensor array for detecting a plurality of features indicative of physiological activity of an isolated biological sample and producing signals representative of said features;
a transducer for converting said signals into a machine readable form; and
a processor configured to derive a vector quantity from said signals.
25. (New) The system of claim 24, further comprising an amplifier for amplifying the signals from the sensor.
26. (New) The system of claim 25, wherein the amplifier is a multi-channel amplifier.
27. (New) The system of claim 24, wherein the sensor array comprises a plurality of electrodes.
28. (New) The system of claim 24, wherein said processor comprises a clustering algorithm.
29. (New) The system of claim 28, wherein said algorithm is a polythetic agglomerative algorithm, a k-means algorithm or an iterative relocation algorithm.
30. (New) The system of claim 24, wherein said physiological activity is static or changing physiological activity.
31. (New) The system of claim 24, wherein the physiological activity is intracellular activity, extracellular activity, or a combination thereof.
32. (New) The system of claim 24, wherein the physiological activity is endogenous cellular activity.

33. (New) The system of claim 24, wherein the physiological activity is in response to an external stimulus.
34. (New) The system of claim 33, wherein the stimulus is a natural or a synthetic stimulus.
35. (New) The system of claim 33, wherein the said stimulus is a toxin or a chemical compound.
36. (New) The system of claim 35, wherein said toxin or chemical compound is a known or unknown toxin or chemical compound.
37. (New) The system of claim 24, wherein the physiological activity is electrical, chemical, fluorescent, or luminescent activity falling within the electromagnetic spectrum.
38. (New) The system of claim 24, wherein the feature is an amplitude dependent feature.
39. (New) The system of claim 24, wherein the feature depends upon a recovery rate of one or more cells in response to an external stimulus.
40. (New) The system of claim 39, wherein the stimulus is a natural or a synthetic stimulus.
41. (New) The system of claim 39, wherein the stimulus is a toxin or a chemical compound.
42. (New) The system of claim 41, wherein said toxin or chemical compound is a known or unknown toxin or chemical compound.
43. (New) The system of claim 24, wherein the biological sample comprises a tissue or a cell sample.
44. (New) The system of claim 43, wherein the biological sample is a cell sample comprising electrically active cells.

45. (New) The system of claim 44, wherein the electrically active cells are cardiomyocytes, muscle cells, or neuronal cells.
46. (New) The system of claim 24, wherein the detected feature is an electrical signal.
47. (New) The system of claim 46, wherein the electrical signal is an intracellular signal.
48. (New) The system of claim 46, wherein the electrical signal is generated by an external cellular membrane.
49. (New) The system of claim 24, further comprising memory.
50. (New) The system of claim 49, wherein the memory comprises a library of features characterizing known compounds.
51. (New) A method for characterizing physiological activity of an isolated biological sample, said method comprising the steps of:
detecting a plurality of features indicative of physiological activity using a sensor array; and
deriving a vector quantity based on the detected features.
52. (New) The method of claim 51, further comprising the step of comparing the derived vector quantity to a reference.
53. (New) The method of claim 52, wherein said reference is a library of predetermined behavioral features of said biological sample.
54. (New) The method of claim 51, further comprising the steps of:
exposing the isolated biological sample to one or more external stimuli;
detecting a plurality of features indicative of physiological activity in response to the one or more external stimuli using the sensor array; and
deriving a second vector quantity based on the detected features.

55. (New) The method of claim 54, wherein said biological sample is exposed to said one or more external stimuli separately, together, or in a sequential manner.
56. (New) The method of claim 54, further comprising the step of comparing the derived vector quantity to a reference.
57. (New) The method of claim 56, wherein the reference is a library of features characterizing known compounds.
58. (New) The method of claim 54, wherein the stimulus is a natural or a synthetic stimulus.
59. (New) The method of claim 54, wherein the stimulus is a toxin or a chemical compound.
60. (New) The method of claim 59, wherein said toxin or chemical compound is a known or unknown toxin or chemical compound.
61. (New) The method of claim 51, wherein the feature is an amplitude dependent feature.
62. (New) The method of claim 51, wherein the feature depends upon a recovery rate of one or more cells in response to the stimulus.
63. (New) The method of claim 51, wherein the physiological activity is electrical, chemical, fluorescent, or luminescent activity falling the electromagnetic spectrum.
64. (New) The method of claim 51, wherein the sensor array comprises a plurality of electrodes.
65. (New) The method of claim 51, wherein the detected feature is an electrical signal.
66. (New) The method of claim 65, wherein the electrical signal is an intracellular signal.

67. (New) The method of claim 65 wherein the electrical signal is generated by an external cellular membrane.
68. (New) The method of claim 51, wherein the biological sample comprises a tissue or a cell sample.
69. (New) The method of claim 68, wherein the biological sample is a cell sample comprising electrically active cells.
70. (New) The method of claim 69, wherein the electrically active cells are cardiomyocytes, muscle cells, or neuronal cells.
71. (New) The method of claim 51, wherein said physiological activity is static or changing physiological activity.
72. (New) The method of claim 51, wherein the physiological activity is intracellular activity, extracellular activity, or a combination thereof.
73. (New) The method of claim 51, wherein the physiological activity is electrical, chemical, fluorescent, or luminescent activity falling within the electromagnetic spectrum.
74. (New) The method of claim 51, wherein the vector quantity is derived using a clustering algorithm selected from a polythetic agglomerative algorithm, a k-means algorithm or an iterative relocation algorithm.